

Appln. Serial No. 10/693,244
Amendment Dated July 30, 2007
Reply to Office Action Mailed May 31, 2007

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CURRENT LISTING OF THE CLAIMS

This listing of claims replaces all prior versions, and listings, of claims in the application:

- 1 1. (Previously Presented) A method of forming a microcrystalline thin film, comprising:
2 supplying, during a first process, SiH_4 and H_2 to a chamber in which a substrate is
3 located;
4 during the first process, applying an electric field to break down the SiH_4 to SiH_2 ;
5 supplying, during a second process, H_2 but not SiH_4 to the chamber;
6 depositing a portion of the microcrystalline thin film during the second process, wherein
7 depositing the portion comprises adsorbing the SiH_2 to a surface of the substrate to form
8 microcrystals, and wherein the portion of the microcrystalline thin film is formed without
9 converting amorphous silicon to the microcrystals; and
10 performing the first process and second process a plurality of times to form the
11 microcrystalline thin film having a target film thickness on the substrate.
- 1 2. (Cancelled)
- 1 3. (Previously Presented) The method of claim 1, wherein performing the first process and
2 second process a plurality of times is performed without removing the substrate from the
3 chamber.
- 1 4. (Previously Presented) The method of claim 26, further comprising applying an electric
2 field in the chamber to break down the SiH_4 to SiH_2 .
- 1 5. (Previously Presented) The method of claim 4, wherein supplying the H_2 comprises
2 supplying the H_2 at a generally constant rate.
- 1 6. (Original) The method of claim 4, further comprising depositing the SiH_2 to a surface of
2 the substrate during the second process.

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- 1 7. (Previously Presented) The method of claim 26, further comprising:
2 converting SiH_4 to SiH_2 ; and
3 depositing SiH_2 on the substrate during the second process.
- 1 8. (Previously Presented) The method of claim 7, wherein depositing SiH_2 on the substrate
2 during the second process without supplying SiH_4 reduces formation of a polymer due to SiH_2
3 molecules encountering each other prior to depositing of SiH_2 on the substrate.
- 1 9. (Cancelled)
- 1 10. (Previously Presented) The method of claim 28, wherein bonding of SiH_2 is suppressed
2 in the source depositing process.
- 1 11. (Cancelled)
- 1 12. (Previously Presented) The method of claim 28, wherein H_2 is supplied at a constant
2 flow rate throughout said source supplying process and said source depositing process.
- 1 13. (Previously Presented) The method of claim 28, wherein a flow rate ratio, r , of SiH_4 and
2 H_2 satisfies $r \geq -(7/12) \times P + 72.5$, where P is an electric field intensity density irradiated on SiH_4
3 and H_2 .
- 1 14. (Previously Presented) The method of claim 28, wherein performing said source
2 supplying process comprises performing the source supplying process for 2 seconds or less, and
3 performing said source depositing process comprises performing said source depositing process
4 for longer than said source supplying process.
- 1 15.-16. (Cancelled)

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1 17. (Previously Presented) A method of manufacturing a thin film transistor comprising:
2 forming a gate electrode on the substrate;
3 forming an insulation layer film on said substrate and said gate electrode,
4 forming at least a portion of a channel layer film on said insulation layer by using the
5 microcrystalline thin film forming method of claim 28; and
6 forming a source/drain electrode on said channel layer.

1 18. (Previously Presented) The method of manufacturing a thin film transistor of claim 17,
2 wherein forming the channel layer film comprises forming the microcrystalline thin film up to 1
3 nm away into the channel layer film from the interface with said insulation layer.

1 19.-25. (Cancelled)

1 26. (Previously Presented) A method of forming a microcrystalline thin film, comprising:
2 supplying, during a first process, SiH_4 and H_2 to a chamber in which a substrate is
3 located;
4 supplying, during a second process, H_2 but not SiH_4 to the chamber;
5 depositing a portion of the microcrystalline thin film during the second process; and
6 performing the first process and second process a plurality of times to form the
7 microcrystalline thin film having a target film thickness on the substrate,
8 wherein supplying SiH_4 and H_2 during the first process comprises supplying SiH_4 at a
9 first rate and H_2 at a second rate, the first rate and second rate defining a flow rate ratio that
10 prevents a thin film formed on the substrate from becoming amorphous.

1 27. (Previously Presented) The method of claim 26, further comprising applying an electric
2 field during the first process, the electric field set at an intensity that in combination with the
3 flow rate ratio prevents a thin film formed on the substrate from becoming amorphous.

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1 28. (Previously Presented) A method of forming a microcrystalline thin film by activating
2 SiH_4 , and forming a film having a microcrystalline structure on a film forming target object,
3 wherein activating SiH_4 comprises applying an electric field to break down SiH_4 to SiH_2 , the
4 method further comprising:
5 performing a source supplying process in which SiH_4 is supplied,
6 performing a source depositing process in which the supply of SiH_4 is stopped and SiH_2
7 is deposited on the film forming target object to form the microcrystalline structure, and
8 supplying H_2 during the source supplying process and during the source depositing
9 process, SiH_4 and H_2 being supplied at flow rates during the source supplying process to prevent
10 a film formed on the film forming target object from becoming amorphous.

1 29. (Previously Presented) A method of forming a microcrystalline thin film, comprising:
2 supplying, during a source supplying process, SiH_4 and H_2 to a chamber in which a
3 substrate is located, wherein the SiH_4 is supplied at a first rate and the H_2 is supplied at a second
4 rate, the first and second rates defining a flow rate ratio to prevent formation of a layer of an
5 amorphous film during the source supplying process; and
6 depositing the microcrystalline thin film on the substrate, wherein prior to depositing the
7 microcrystalline thin film, the supplying of SiH_4 to the chamber is stopped.

1 30. (Previously Presented) The method of claim 29, further comprising:
2 applying an electric field in the chamber during the source supplying process to break
3 down SiH_4 to SiH_2 molecules,
4 wherein depositing the microcrystalline thin film is performed during a source depositing
5 process, and wherein a majority of the SiH_2 molecules is adsorbed on the substrate during the
6 source depositing process to deposit the microcrystalline thin film on the substrate.

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- 1 31. (Previously Presented) A method of forming a microcrystalline thin film, comprising:
2 supplying SiH_4 and H_2 to a chamber in which a substrate is located; and
3 depositing the microcrystalline thin film on the substrate, wherein prior to depositing the
4 microcrystalline thin film, the supplying of SiH_4 to the chamber is stopped,
5 wherein supplying SiH_4 and H_2 comprises supplying SiH_4 at a first rate and H_2 at a
6 second rate, the first rate and second rate defining a flow rate ratio that prevents a thin film
7 formed on the substrate from becoming amorphous.